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POWDER SAMPLING DEVICE

DESCRIPTION

This invention relates to a powder sampling device.

It may be used in particular to take intermittent samples of powder flowing more or less continuously in an industrial process, in order to check the composition or quality, and is particularly advantageous if the volumes must be invariable, fine or are dangerous.

Traditional sampling devices include valves, taps or analogous devices, but they are poorly suited to powders, which can easily penetrate into moving parts and cause them to seize, and providing an efficient seal against leaks of dangerous materials is hard to ensure. Furthermore, it is difficult to adjust the volume that is sampled, with such means.

Another major problem that needs to be resolved to obtain satisfactory samples consist of avoiding stagnation of the powder from an earlier moment in the flow around the sampling device, which would be mixed in with the powder sampled and comprise the reliability of the measurement.

Another problem which could be important consists of avoiding the sampling device from disrupting the flow, which could furthermore lead to the problem mentioned above, of creating a pocket of stagnant powder in front of the device.

The powder sampling device of the document US 4 024 765 comprises: an appended part, generally empty of powders, of a powder flow channel; a drawer traversing

a wall of the appended part, and sliding between a first position where a groove in it extends into the appended part and a second position where the groove extends beyond the appended part, the groove being  
5 limited by faces where the powder slides or falls; and a flap in the flow channel, moving between a withdrawn position where it has no essential effect on the flow of the powders and an extended position where it directs the flow of the powders into the appended part.

10 It appears that the flow of the powders passes beside the sampling device in normal conditions, and is not likely to be disrupted by it or to foul it by stagnating powder. In the sampling position, the powder or a portion of it is on the contrary temporarily  
15 directed towards the appended part containing the sampling device and fills the drawer groove, which may then be moved to the second position where the volume of the powder contained in the groove is sampled and analysed. In this patent, the drawer is pushed into the  
20 appended part when the powder fills it. A powder sample enters the groove, then the drawer is removed and is turned over. The content of the groove then escapes from it entirely. This design may be criticised in that the drawer is moved in a translation and rotation  
25 movement, which is complicated, increases the possibility of friction and seizure, and that quite a large volume of powder must fill the appended part for a sample to be taken.

A representative sample of the flow at a specific  
30 given time may become impossible.

The invention may be considered as a perfection of this design: it is original in that the drawer has an upright orientation (more or less vertical) and that the groove is limited by a ceiling face and an angled face which extend a base plate of the appended part when the drawer is in the first position.

In a preferred embodiment, the appended part is a corbelled part of the channel and its base plate is angled towards the channel; the second position is situated below the first position; and the flap rotates, the withdrawn position being more or less vertical and the extended position being angled through the channel, the flap touching the base plate just below the groove in the first position of the drawer.

It is guaranteed that the volume of powder directed towards the appended part, but not being part of the sample taken, rejoins the main flow by sliding on the angled base plate; the continuity of this angled base plate and the angled face of the groove ensures that it is filled, by means of the regularity of the flow; and the proximity of the groove and the end of the flap in the extended position ensures that the groove is filled even with a low powder flow rate. Furthermore, a simple translation movement is sufficient to impose the flow of the powder out of the groove when in the withdrawn position; and if it is intended to stop sampling, the flap is simply folded back and the contents of the groove return to the main flow.

Even more satisfactory operating and sampling conditions are achieved if the flap is a spout

comprising an incurved wall extending into a second corbelled section of the channel, as the flap in no way disrupts the flow in the withdrawn position, but it ensures the powder is gathered towards the groove in  
5 the extended position.

The invention will now be described by means of figures 1 and 2, which represent the two main states of the device.

In figure 1, the powder flows freely. It falls via  
10 a vertical channel 1, whose sampling section comprises however an appended part composed of two corbelled sections 2 and 3, situated opposite one another on the periphery. The first contains a drawer 4 which traverses it from one side to the other and comprises a  
15 vertical rod featuring a groove 5. The groove 5 extends to just above an inside base plate 6 of the corbelled section 2 that is angled towards the channel 1, and it is limited by a ceiling surface 7 and above all by an angled face 8 which, in the position shown, extends the  
20 base plate 6. The drawer 4 is articulated to a lever 9 above the corbelled section 2, and the lever 9 tilts around a pivot 10, and is driven on the opposite side by an eccentric shaft 11 driven by a motor that is not shown. Below the corbelled section 2 extends a mouth  
25 section 12 that the drawer 4 may occupy partially that is surrounded by a flat seal 13 under which a beaker 14 may be positioned to collect the samples.

The corbelled section 3 comprises a flap 15 in the form of a spout, presenting incurved sections dished in  
30 the middle which run more or less vertically in the configuration shown in figure 1, where it is withdrawn:

it therefore does not essentially disrupt the flow of the powder through the channel 1. It is attached to an upper rotation shaft 16 driven by another motor, which is not shown either.

5        We begin by referring to figure 2 to discover how the powder sample is made. The flap 15 is firstly extended by rotation of the shaft 16 to a state where it extends through the channel 1 and its end touches the base plate 5 of the corbelled section 2, just below  
10 the groove 5 in the raised position shown in figure 1. At least a portion of the powder flow is directed towards the appended section of the channel 1 formed by the inside of the corbelled section, 2, and in particular in the volume of the groove 5 which is  
15 completely filled. It should be noted that if the flap 15 has incurved walls, it can make the powder that it intercepts converge into a narrower flow which consequently fills the groove 5 more easily, especially if its section becomes narrower towards the bottom,  
20 which makes the device advantageous even with low powder flow rates, as it can even be envisaged to direct almost all of the powder flow temporarily towards the groove 5. When the groove is filled, tilting the lever 9 lowers the drawer and places the  
25 groove 5 in the mouth 12, and its contents run into the beaker 14 or other. The slope of the base plate 8 is sufficient for the powder to flow with no retention, and the powder even flows completely from the base  
plate 6 of the corbelled section 2 as soon as the flap  
30 15 is removed and returns to its initial position; as this position is more or less vertical, there is no

residue of the powder on the flap 15 either. The sample taken will therefore be completely representative of the powder flow at that time. Similarly, the powder which may have accumulated under the ceiling face 7 is  
5 completely detached when the sample flows from the groove 5; the ceiling face 7 is therefore called a powder chute face, and the lower face 8 is called a powder slide face (as the base plate 6).